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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : H04Q 7/08

A1

(11) International Publication Number: WO 00/24208

(43) International Publication Date: 27 April 2000 (27.04.00)

(21) International Application Number: PCT/US99/20784

(22) International Filing Date: 10 September 1999 (10.09.99)

(30) Priority Data:
09/177,303 22 October 1998 (22.10.98) US

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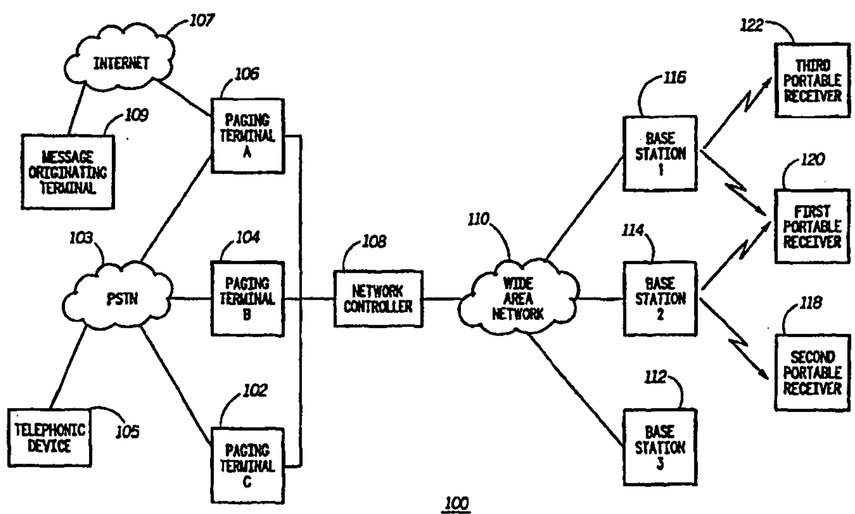
(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(54) Title: TIME SHARING PAGING SYSTEM



100

(57) Abstract

A communication system (100) includes more than one paging terminal (102, 104 and 106) communicatively coupled to a single paging network controller (108) operating on a radio channel using a synchronous time-division communication paging protocol having frames, with the radio channel shared among the paging terminals on a frame-by-frame basis, allowing more than one service provider to share most of the infrastructure of a paging system. Each paging terminal has a different System ID (212) and provision for a different System Collapse Value (214). A System ID is transmitted within each frame (903) of the protocol, allowing each frame to be allocated to a particular paging treminal and to selective call receivers associated with the particular paging terminal. In an alternate embodiment, a single paging terminal (300) has more than one System ID (315, 317) and provision for more than one System Collapse Value (312, 314).

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TIME SHARING PAGING SYSTEM

Field of the Invention

This invention relates in general to radio communication systems, and more specifically to a method and apparatus for sharing a communication channel in a selective call communication system.

Background of the Invention

A selective call communication system, or paging system, comprises an infrastructure and a plurality of selective call receivers, or pagers. Each service provider, or operator, of a paging system, generally has a completely separate infrastructure from the infrastructure of operators of other paging systems. However, there is a need to utilize a single infrastructure and share a paging channel to save infrastructure costs. With prior art paging systems, it is difficult for more than one operator to share a paging channel using a single infrastructure. Each selective call receiver on a paging channel within prior art paging systems has a unique pager address. Disadvantageously, if more than one operator were to attempt to share a paging channel of a prior art paging system, each operator could not use all the pager addresses available; but rather, the operators would have to coordinate the allocation of pager addresses among themselves to avoid use of a same pager address by more than one operator. If two operators were to assign a same address to one of each of their customer's selective call receivers, two customers would disadvantageously receive the same messages. Also, disadvantageously, with prior art paging systems, it is not possible for each of the operators, who share an infrastructure, to use a different System Collapse Value; but rather, there must be only one System Collapse Value for the infrastructure that is being shared. There is also a need, not possible with prior art paging systems, for more than one operator to use the single infrastructure to share a single channel on a frame-by-frame basis, with respect to frames of a synchronous communication protocol, such as the FLEX™ paging protocol of Motorola, Inc., of Schaumburg, Illinois.

Thus, what is needed is a paging system that allows more than one operator to share a paging channel using a single infrastructure while allowing each operator to utilize the full range of addresses without regard to possible duplication of addresses, while also allowing selective call receivers to battery-save, or sleep, during occurrence of frames not assigned the service provider for those selective call receivers, and while further allowing more than one System Collapse Value on the single infrastructure.

Brief Description of the Drawings

FIG. 1 is a functional block diagram of a communication system in accordance with a preferred embodiment of the invention.

FIG. 2 is a functional block diagram of a paging terminal in accordance with the preferred embodiment of the invention.

FIG. 3 is a functional block diagram of an alternative paging terminal in accordance with the preferred embodiment of the invention.

FIG. 4 is a functional block diagram of a network controller in accordance with the preferred embodiment of the invention.

FIG. 5 is a functional block diagram of a selective call receiver in accordance with the preferred embodiment of the invention.

FIGS. 6 and **7** are signaling diagrams depicting a prior art signaling protocol.

FIG. 8 is a signaling diagram illustrating an exemplary signaling protocol for transmitting a System ID over a communication channel in accordance with the preferred embodiment of the invention.

FIG. 9 is a signaling diagram depicting an example of communication channel sharing in accordance with the preferred embodiment of the invention.

FIG. 10 is a flow diagram illustrating operation of the communication system in accordance with the preferred embodiment of the invention.

FIG. 11 is a flow diagram showing exemplary operation of a selective call receiver in accordance with the preferred embodiment of the invention.

Description of the Preferred Embodiment

Referring to **FIG. 1**, a communication system **100** comprises a network controller **108** for formatting and queuing selective call messages, or messages, and for controlling the transmission thereof. The network controller **108** is communicatively coupled, such as via a high speed network, to at least one paging terminal **102, 104** and **106**, for receiving requests to send messages directed to selective call receivers **118, 120** and **122** in a manner well known in the art. For illustrative purposes, paging terminal C **102** is shown coupled by at least one telephone line to the Public Switched Telephone Network (PSTN) **103** for receiving paging requests via telephonic devices such as telephones **105**, and paging terminal A **106** is depicted coupled to the Internet **107** for receiving paging requests via message originating terminals **109**. Of course, a single paging terminal could be coupled both to the PSTN and to the Internet.

The network controller **108** is coupled via a wide area network **110** to at least one transmitter base stations **112, 114** and **116** for transmitting the messages by radio communications to selective call receivers **118, 120** and **122** communicating according to a wireless communication protocol, such as the FLEX™ paging protocol. The FLEX paging protocol is more fully described in U. S. Patent No. 5,555,183 entitled *Method and Apparatus for Synchronizing to a Synchronous Selective Call Signal*, issued September 10, 1996, to Willard, et al., which is assigned to the assignee of the present invention, and which is hereby fully incorporated by reference herein. The hardware of the paging terminals **102, 104** and **106** preferably includes a Wireless Messaging Gateway (WMG™) Administrator!™ paging terminal, manufactured by Motorola, Inc., of Schaumburg, Illinois. The hardware of the network controller **108** preferably includes a Choreographer!® network management device, a RF-Conductor!® message distributor, and a RF-Usher!™ multiplexer, manufactured by Motorola, Inc. The network controller has software elements modified in accordance with the present invention, and preferably runs under a UNIX operating system. The hardware of the base station **112, 114** and **116** preferably includes a Nucleus® Orchestra!™ transmitter manufactured by Motorola, Inc. The selective call receivers

118, **120** and **122**, are preferably similar to an Advisor® Elite™ selective call receiver manufactured by Motorola, Inc. It will be appreciated that other similar equipment may be used as well to construct a paging system, such as the communication system **100**. The hardware and data structures of paging terminals **102**, **104** and **106** are substantially similar; therefore, only paging terminal **102** will be described in more detail. Of course, the content of the data structures of each of the paging terminals **102**, **104** and **106** are different from each other in accordance with the invention.

According to one preferred embodiment of the invention, as depicted in **FIG. 2**, a paging terminal **102** comprises a subscriber database **202** in a non-volatile memory. The subscriber database **202** includes at least one subscriber record, such as subscriber records **204**, **206**, **208**, and **210**. Each subscriber record includes pager addresses **205**, **207**, **209** and **211** for uniquely identifying at least one associated selective call receiver in the communication system **100**. A System ID **212** is stored in a non-volatile memory for uniquely identifying a population of subscribers being serviced by a paging terminal **102**. A System Collapse Value **214** is stored in non-volatile memory as an operational parameter for handling a battery saving cycle for the selective call receivers associated with the population of subscribers being serviced by the paging terminal **102** as part of a predetermined battery saving method, as is discussed below. An exemplary battery saving cycle algorithm utilizing a System Collapse Value **214** for selective call receivers is generally well known in the art such as supported by the FLEX paging protocol.

According to an alternative preferred embodiment of the invention, as depicted in **FIG. 3**, a paging terminal **300** comprises a subscriber database **302** in a non-volatile memory. The subscriber database **302** includes at least one subscriber record, such as subscriber records **304**, **306**, **308**, and **310**. Each subscriber record includes pager addresses **305**, **307**, **309** and **311** for uniquely identifying an associated selective call receiver in the communication system **100**. Additionally. each subscriber record includes System ID information to identify one System ID **315**, **317**, **319** and **321** for each individual subscriber record in the paging terminal **300**. Separate, optionally different, System Collapse Values **312** and **314**, stored in non-volatile memory, are

associated with each of two population of subscribers being serviced by the one paging terminal **300**, as identified by the respective System ID **315**, **317**, **319** and **321**, respectively, in each of the subscriber records. In this example, some of the subscribers have "System ID 1" in their subscriber records and other of the subscribers have "System ID 2" in their subscriber records. In this way, two population of subscribers can be serviced by a single paging terminal **300**, as is more fully discussed herein below. Of course, the paging terminal **300** can have more than two System Collapse Values stored in its non-volatile memory, in which case, more than two populations of subscribers can be serviced from the one paging terminal, and each population can advantageously have a separate, and optionally different, System Collapse Value.

Referring again to **FIG. 2**, during operation, the paging terminals **102**, **104** and **106** receive and queue paging requests from callers using telephones **105** and/or message originating terminals **109** to send messages to an individual or a group of the selective call receivers **118**, **120**, and **122**. Each paging terminal then forwards a paging request, including System ID **212**, pager address **205**, and message (not shown), to the network controller **108**. Each paging terminal transmits its System Collapse Value **214** to the network controller **108** to update therein the System Collapse Value **214** associated with each respective paging terminal of the communication system **100**. The System Collapse Value **214** is transmitted to the network controller **108** upon system initialization and/or periodically as each of the paging terminals **102**, **104** and **106** updates its System Collapse Value in the network controller **108** to manage a battery saving cycle for selective call receivers associated with subscribers being serviced by each of the paging terminals **102**, **104**, and **106**.

FIG. 4 is a functional block diagram of the network controller **108**. The network controller **108** handles the transmission of messages over a communication channel. The network controller **108** comprises a channel controller **402** electrically coupled to a non-volatile memory containing a channel outbound message queue **404** where frames **602** (see **FIG. 6**) are built from queued paging requests received from the paging terminals **102**, **104** and **106**. The channel controller **402** periodically, e.g.,

every minute, controls the base stations **112**, **114** and **116** to transmit the queued message over the communication channel to the selective call receivers **118**, **120** and **122**.

The hardware and data structures of selective call receivers **118**, **120** and **122** are substantially similar; therefore, only selective call receiver **118** will be described in more detail. Of course, the content of the data structures of each of the selective call receivers **118**, **120** and **122** are different from each other in accordance with the invention. **FIG. 5** is a functional block diagram of a selective call receiver **118**. Selective call receiver **118** comprises a controller **502** electrically coupled to a non-volatile memory containing a pager address memory **506** for storing at least one pager address for the selective call receiver **118**. The selective call receiver **118** utilizes the at least one pager address to selectively receive messages that are destined for reception by the selective call receiver **118** as indicated by pager address information associated with each message. Addressing methods for selective reception of messages that are associated with pager address information are well known, such as supported by the FLEX paging protocol.

The non-volatile memory in the selective call receiver **118** preferably also includes a System ID memory **504**. The System ID memory **504** is used by the selective call receiver **118** to identify transmissions over the communication channel that may include messages destined for reception by the selective call receiver **118**. A population of subscribers, as discussed above, may be serviced by each of the paging terminals **102**, **104** and **106**. The population of subscribers is identified by a unique System ID. The messages being transmitted to each selective call receiver associated with the population of subscribers is transmitted in a transmission preferably including (or otherwise being associated with) the System ID for the population of subscribers. This preferred aspect of the communication system **100** of the invention is more fully discussed below.

The non-volatile memory in the selective call receiver **118** preferably also includes a pager collapse value memory **508** and a System Collapse Value memory **510**. These collapse values are utilized by the selective call receiver **118** in a power

conservation scheme, e.g., to manage a battery saving cycle, for the selective call receiver **118** as is more fully discussed below.

Transmissions over the communication channel, as illustrated in **FIG. 6**, prior art, include a transmission stream **600** comprising a repeating cycle **601** of a plurality of predetermined frame positions, i.e., frames, **602**. For example, a FLEX paging protocol cycle includes one hundred twenty-eight (128) frames **602**.

Each selective call receiver **118** receives information during a frame corresponding to its base frame position preprogrammed in a base frame memory (not shown) in the non-volatile memory in the selective call receiver **118**, and it can be further programmed to receive information in additional frames related to the base frame position according to a pager collapse value and a System Collapse Value **214** respectively programmed in the pager collapse value memory **508** and in the System Collapse Value memory **510** of the selective call receiver **118**. In such a case, the selective call receiver **118** searches additional frames for messages destined for reception by the selective call receiver **118**. The selective call receiver **118** searches frame positions that are a predetermined offset from the base frame position according to the pager collapse value. However, if the System Collapse Value **214** is smaller than the pager collapse value, then the selective call receiver **118** would search frame positions that are a predetermined offset from the base frame position according to the System Collapse Value. Exemplary aspects of this preferred signaling system are disclosed in U. S. Patent No. 5,423,057, entitled *Method and Apparatus for Sharing Signaling Formats in a Communications Channel*, issued June 6, 1995, to Kuznicki, et al., in U. S. Patent No. 5,168,493, entitled *Time Division Multiplexed Selective Call System*, issued December 1, 1992, to Nelson, et al., and in U. S. patent application Serial No. 08/689,617 entitled *Method and Apparatus for Dynamically Adjusting a Battery Saving Interval in a Messaging System*, filed August 12, 1996, by Hill, et al., which are assigned to the assignee of the present invention, and which are hereby fully incorporated by reference herein.

Referring to **FIG. 7**, the prior art signaling system that is compatible with the invention utilizes a format **700** for each frame **602** comprising a frame header portion

702 and a frame message portion 703. The frame header portion 702 includes frame synchronization portions, including a bit synchronization portion 704 for providing bit synchronization, and a word synchronization portion 706 for providing word synchronization to the selective call receiver 118 while searching the frame. Within the bit synchronization portion 704 is located a $\overline{BS1}$ portion 800. The prior art bit $\overline{BS1}$ portion 800 normally comprises sixteen (16) bits of an alternating 0,1 bit pattern in a frame formatted according to the FLEX paging protocol.

Referring now to **FIG. 8**, a System ID 802 in accordance with the invention is located within the $\overline{BS1}$ portion 800. In accordance with the invention, the System ID 802 comprises six (6) bits, and the System ID 802 is located between a leading six (6) bit portion 804 and a trailing four (4) bit portion 806 of the alternating 0,1 bit pattern of a revised $\overline{BS1}$ portion. By locating the System ID 802 in this way, the bit synchronization portion 704 still provides substantial bit synchronization for the selective call receiver 118 while also providing a System ID 802 to identify the frame as containing messages for reception by selective call receivers associated with a subscriber population being serviced by a particular paging terminal, i.e., being serviced by a particular paging system of the communication system 100. With the System ID 802 preferably being six bits, at least four systems, e.g., 0 - 3, can be uniquely identified by the four System ID bit patterns shown in **Table 1**.

TABLE 1

System IDs

000 000 = 0

000 111 = 1

111 000 = 2

111 111 = 3

The exemplary System ID bit patterns shown in **Table 1** utilize redundancy, i.e., three bits for each of two binary value positions, to increase the reliability of detecting the System ID by the selective call receiver 118 searching the frame. Of course, other

methods of formatting a System ID value associated with a transmitted frame are contemplated within the present invention. The System ID **802** in accordance with the invention is not constrained to being within the bit synchronization portion **704** or even within the frame header portion **702** of a frame **602**, but is alternatively located in another portion of the frame **602** or in another portion of the transmission stream **600**. However, the System ID is preferably located as close to the beginning of each frame as practical. Such location allows a selective call receiver to be able to determine as early as possible after a frame begins, whether the particular frame is associated with the service provider for that selective call receiver, thereby allowing the selective call receiver to stay on a minimal amount of time if the System ID decoded is not the System ID stored in System ID memory **504** of the selective call receiver.

One significant advantage of utilizing the System ID to identify selective call receivers associated with a population of subscribers being serviced by a paging terminal is that each such population of subscribers can independently utilize the full range of pager address values available for the communication system **100** without conflicting with any other such population being contemporaneously serviced within the communication system. Therefore, a first pager address for a first selective call receiver **118** can equal a second pager address for a second selective call receiver **120**, as long as the two selective call receivers belong to two separate subscriber populations as identified by two different System IDs, respectively, within the transmission stream **600**. There would be no possibility for selective call receiver **118** to receive a message intended for selective call receiver **120** (or vice versa) because, in this example, the first selective call receiver **118** only searches those frames that are assigned to the first System ID, and the second selective call receiver **120** only searches those frames that are assigned to the second System ID. When a frame **602** is associated with a first System ID, for example, the second selective call receiver **120** would, upon determining this condition, immediately return to a sleep mode in its predetermined battery saving cycle to conserve power for its power source, such as a battery (not shown).

Another advantage of utilizing the System ID to identify selective call receivers associated with a population of subscribers being serviced by a paging terminal **102**,

104 and 106 is that each such population of subscribers can independently utilize a System Collapse Value 214. This allows the system operator to better manage a battery saving cycle for populations of subscribers associated with a particular System Collapse Value 214. The System Collapse Value 214 for a population determines how often the associated selective call receivers 118, 120 and 122 of the population will search frames within a transmission stream. A very short System Collapse Value, for example, directly impacts the useful life of the power source, e.g., battery, of each selective call receiver because as the selective call receiver searches frames more often, it depletes its battery faster. Alternatively, a relatively long the System Collapse Value combined with a relatively long pager collapse value may cause selective call receivers to search frames at very long intervals. This tends to increase battery life for the selective call receivers; however, the queuing for messages to be transmitted to the selective call receivers also tends to increase because of the more infrequent opportunities to transmit messages to the selective call receivers based on the longer collapse values. This longer queuing, especially during peak system message loading intervals, may tend to delay message delivery to the selective call receivers by an unacceptably long amount of time. By allowing each population of subscribers to be associated with a different System ID, the system operator for those subscribers can more closely manage the trade-off between battery life and messaging delay for the population of subscribers. In a conventional FLEX paging system, there is no System ID, and there is normally only one System Collapse Value 214 for all selective call receivers in a communication system. Therefore, the association of a System ID and a System Collapse Value 214 with each population of subscribers within a communication system in accordance with the present invention provides advantages over the known prior art.

Furthermore, in accordance with the invention, each paging terminal can communicate programming commands, preferably via over-the-air transmissions, to any one of the selective call receivers 118, 120 and 122 associated with a population of subscribers being serviced by the paging terminal. For example, the programming commands instruct the selective call receiver 118 to store a System ID value in System ID memory 504, and/or a System Collapse Value 214 in System Collapse Value

memory **510**, and/or a pager collapse value in pager collapse value memory **508**. The System ID value and/or the System Collapse Value **214** and/or the pager collapse value, are preferably communicated to the selective call receiver **118** along with the programming command within paging message(s) transmitted over-the-air to the selective call receiver **118**. The selective call receiver **118** then utilizes the received value(s) to load into a corresponding memory. Alternatively, the System ID value and/or the System Collapse Value **214** and/or the pager collapse value are, for example, selected (i.e., programmed) from a predefined table in the selective call receiver **118** in response to receiving the programming command in an over-the-air transmission. In this way, the paging terminal can instruct each selective call receiver **118** to reprogram its operational parameters to modify the selective call receiver's operation with respect to a battery saving cycle for the selective call receiver.

FIG. 9 is a signaling diagram depicting an example of communication channel sharing in accordance with the invention. In the example shown in **FIG. 9**, a transmission stream **900** comprises a repeating cycle **901** of one hundred twenty-eight (128) successive frames, with each frame being assigned to one of three different systems. In this example, "Frame 3" **903** is assigned to "System ID 1"; "Frame 4" **904** is assigned to "System ID 2"; and "Frame 5" **905** is assigned to "System ID 3". This pattern of three frame assignments to the three separate systems, could repeat in a round robin fashion, as illustrated, for all one hundred twenty-eight (128) frames of the communication protocol cycle. In this way, three separate system operators are able to time-share the communication system **100**. Three separate, different populations of subscribers are serviced by the communication system **100**. Advantageously, each population of subscribers has full use of a complete address space for pager addresses for its selective call receivers. There is no conflict between a population of subscribers that may use pager addresses that equal pager addresses being used by another population of subscribers. The three separate system operators, in this example, are able to share in the overall costs of the infrastructure (e.g., network controller **108**, wide area network **110**, base stations **112**, **114** and **116**) of the communication system. Flexible cost and resource sharing arrangements could be set up between the independent system operators to support the commercial realities of operating such a

time sharing the communication system **100**. For example, an operator that is responsible for paying 40% of the system costs could be allocated 40% of the communication system transmission resources, such as the frames, available for transmitting messages to its subscribers. In this way, overall system costs and utilization of communication system resources can be allocated between sharing operators in a manner supported by the commercial priorities of the communication system **100**. This is an advantage of the communication system **100** of the present invention not available with known prior art communication systems.

FIG. 10 is a flow diagram illustrating operation of the communication system **100** in accordance with the preferred embodiment of the invention. The communication system **100** enters, at step **1002**, a message transmission sequence. A paging terminal **106** processes a paging request from a telephone **105** or from a message originating terminal **109** by performing a look-up in a subscriber database to locate a subscriber record, step **1004**. The paging terminal **106** creates an outbound message request by getting a pager address from the subscriber record, step **1006**, and by coupling the pager address with a System ID, step **1008**, and with message data, step **1010**. The paging terminal **106** then forwards the outbound message request to the network controller **108** which then queues the outbound message, step **1012**. At an appropriate time, the channel controller **402** controls the base stations **112, 114** and **116**, to transmit the queued outbound message as part of a radio transmission over the communication channel for reception by at least one of the selective call receivers **118, 120** and **122**. The outbound message is transmitted, step **1014**, in a frame that is associated with the System ID for the least one of the selective call receivers **118, 120** and **122**, and the operation ends, step **1016**.

Referring to **FIG. 11**, a flow diagram showing exemplary operation of a selective call receiver **118** in accordance with the preferred embodiment of the invention begins at step **1102**, when the selective call receiver enters a message reception sequence. The selective call receiver **118** enters into a sleep mode, step **1104**. Prior to going into the sleep mode, the controller **502** had computed a computed time at which to wake up after conclusion of the sleep mode based on a current frame position, a base frame

position value, a pager collapse value, and a System Collapse Value **214**, that are stored in non-volatile memory. The controller **502** then goes into the sleep mode. At step **1106**, the selective call receiver **118** wakes up at the computed time to search for its assigned frame. After the selective call receiver **118** wakes up, it attempts synchronization, step **1108**, with a transmission on the communication channel. After initial bit synchronization, and preferably after initial word synchronization, the controller **502** determines, step **1110**, whether the transmitted frame's associated System ID value matches the predetermined System ID value for the selective call receiver **118**, as stored in its System ID memory **504**. If the frame System ID does not match the stored System ID, then the transmission is ignored, step **1110**, and the controller **502** returns the selective call receiver **118** to the low-power battery-saving sleep mode until the next time to wake up. If, on the other hand, at step **1110**, the System ID for the frame is determined to match the System ID value for the selective call receiver **118** stored in System ID memory **504**, then the controller **502** decodes the frame, step **1112**, and searches a portion of the frame containing message information for a message destined for reception by the selective call receiver **118**. After the frame has been decoded, the controller **502** computes the next time to wake up and then returns to a sleep mode at step **1104**.

In this way, a selective call receiver **118** searches only those frames that are assigned to a System ID programmed in the selective call receiver **118**. That is, the selective call receiver **118** only searches frames that are assigned to a system, i.e., as indicated by a System ID corresponding to the frame, with which the selective call receiver **118** is associated. This method of operation provides advantages to subscribers and to operators of the communication system **100** in the following ways. A plurality of populations of subscribers can be independently serviced by at least one paging terminal in the communication system **100**. Each such population has full use of a complete address space, e.g., all possible pager addresses, available in the communication system **100**. System operators can share costs and resources of the communication system **100** without conflict in pager addresses assigned to selective call receivers in their respective systems, as indicated by respective System IDs.

Further, each system operator can flexibly manage a battery saving cycle for selective call receivers associated with the population(s) of subscribers being serviced by the system operator. Over-the-air transmissions can reprogram a selective call receiver to vary its battery saving cycle operation, such as by changing a System ID value, a pager collapse value, and/or a System Collapse Value **214** for the selective call receiver. By utilizing the invention, as an improvement to the FLEX paging protocol, paging systems and system operators would be able to share many paging system infrastructure costs and resources while flexibly managing their respective subscriber's selective call receiver battery saving cycles to better serve their customers.

While a detailed description of the preferred embodiment has been given, it should be appreciated that many variations can be made thereto without departing from the scope of the invention as set forth in the claims.

What is claimed is:

CLAIMS

1. A method of time sharing a communication channel by a first paging system identified with a first System ID and by a second paging system identified with a second System ID, wherein messages from the first paging system and from the second paging system are transmitted over the communication channel in a transmission stream comprising a plurality of predetermined frame positions, and wherein a first selective call receiver is responsive to messages in frame positions in the transmission stream that include the first System ID and a second selective call receiver is responsive to other messages in frame positions in the transmission stream that include the second System ID, the method comprising the steps of:

transmitting a System ID and a message at a frame position, the message corresponding to the first paging system and being destined for reception by the first selective call receiver; and

transmitting another System ID and another message at another frame position, the another message corresponding to the second paging system and being destined for reception by the second selective call receiver.

2. The method of Claim 1, further comprising the step of:

programming a first System Collapse Value in the first selective call receiver for defining a system battery saving interval, the first System Collapse Value for enabling the first selective call receiver to receive messages transmitted in at least one position of the plurality of predetermined frame positions, the at least one position determined from a preprogrammed base frame position and the first System Collapse Value.

3. The method of Claim 1, in which the first selective call receiver is responsive to a first pager address and the second selective call receiver is responsive to a second pager address, and in which the message includes the first pager address and in which the another message includes the second pager address.

4. In a fixed infrastructure portion of a paging system, a method of transmitting a System ID within a synchronization portion, wherein the paging system transmits signals over a communication channel according to a protocol utilizing predetermined sequentially transmitted frames, each frame having a synchronization portion, the method comprising the steps of:

transmitting a System ID within the synchronization portion of one of the frames; and

transmitting another System ID within the synchronization portion of another of the frames.

5. A paging system comprising:

a first paging terminal identified by a System ID for sending messages to a first population of subscribers;

a second paging terminal identified by another System ID for sending messages to a second population of subscribers; and

a network controller, communicatively coupled to the first paging terminal and to the second paging terminal, for receiving messages from the first paging terminal and from the second paging terminal and for forwarding the messages to the first population of subscribers and to the second population of subscribers by transmitting messages in frames of a transmission stream.

6. The paging system of claim 5 in which the network controller transmits messages destined for reception by the first population of subscribers by transmitting the messages in frames of the transmission stream that include the System ID.

7. A paging system comprising:

a paging terminal for sending messages to a first population of subscribers and to a second population of subscribers;

a database including subscriber records with a System ID associated therewith identifying the first population of subscribers, and subscriber records with another System ID associated therewith identifying the second population of subscribers; and

a network controller, communicatively coupled to the paging terminal for receiving messages therefrom and forwarding the messages to the first population of subscribers and to the second population of subscribers by transmitting messages destined for reception by the first population of subscribers in frames of a transmission stream that include the System ID, and by transmitting messages destined for reception by the second population of subscribers in frames of a transmission stream that include the another System ID.

8. The paging system of Claim 7, wherein a subscriber record associated with the System ID comprises a first pager address and wherein another subscriber record associated with the another System ID comprises a second pager address, the second pager address being equal to the first pager address.

9. A selective call receiver comprising:

a receiver for receiving wirelessly transmitted information in frames of a transmission stream;

a System ID memory for storing a System ID; and

a controller coupled to the receiver and the System ID memory for monitoring frames in a wirelessly transmitted transmission stream, the frames being monitored according to a predetermined battery saving cycle for the selective call receiver, the controller after determining that the System ID is not present in a frame being monitored by the controller returns the selective call receiver to a sleep mode in the predetermined battery saving cycle.

10. The selective call receiver of Claim 9, wherein the controller monitors frames for a message comprising a programming command, and in response to receiving the programming command storing a System ID, that corresponds to the programming command, in the System ID memory.

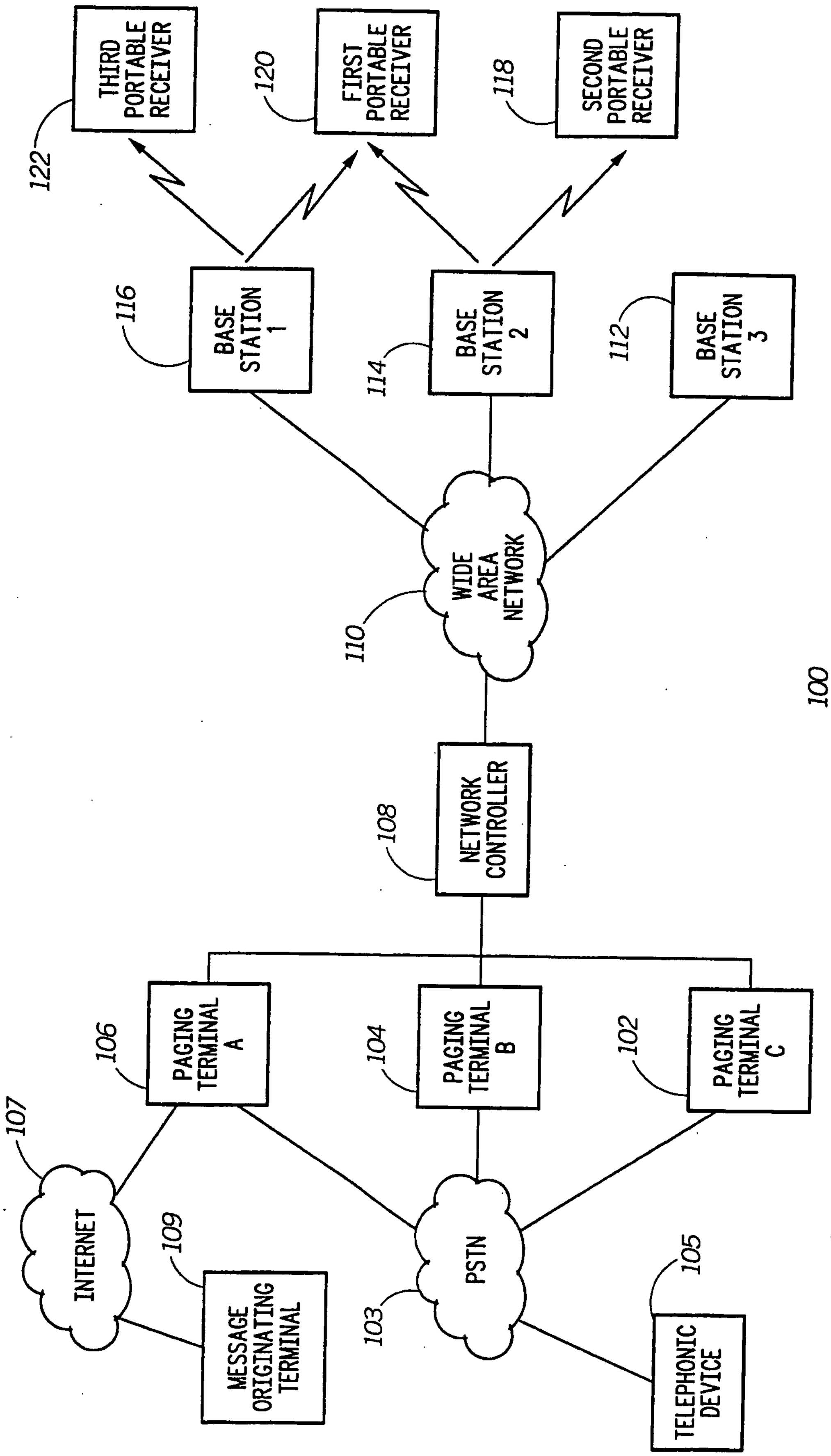

THIRD PORTABLE RECEIVER
122
FIRST PORTABLE RECEIVER
120
SECOND PORTABLE RECEIVER
118
BASE STATION 1
116
BASE STATION 2
114
BASE STATION 3
112
WIDE AREA NETWORK
110
NETWORK CONTROLLER
108
PAGING TERMINAL A
106
PAGING TERMINAL B
104
PAGING TERMINAL C
102
INTERNET
107
MESSAGE ORIGINATING TERMINAL
109
PSTN
103
TELEPHONIC DEVICE
105
100

FIG. 1

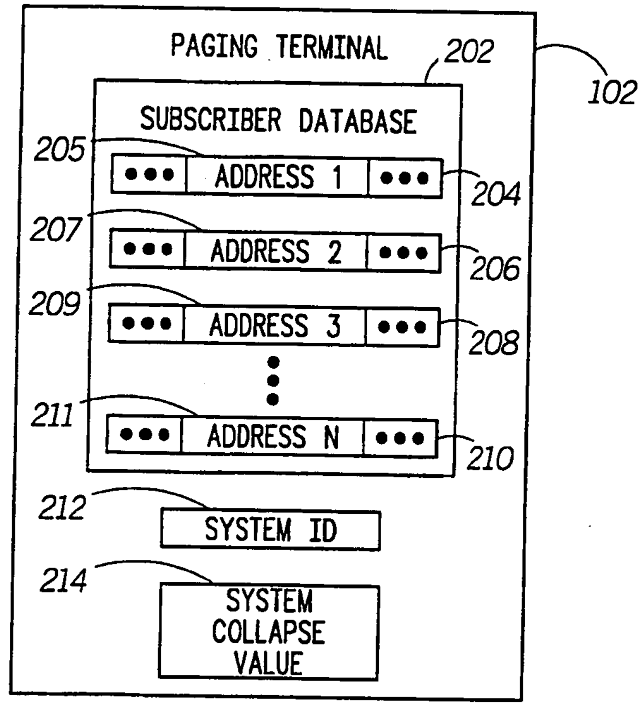

PAGING TERMINAL
202
102
SUBSCRIBER DATABASE
205
ADDRESS 1
204
207
ADDRESS 2
206
209
ADDRESS 3
208
211
ADDRESS N
210
212
SYSTEM ID
214
SYSTEM COLLAPSE VALUE

FIG. 2

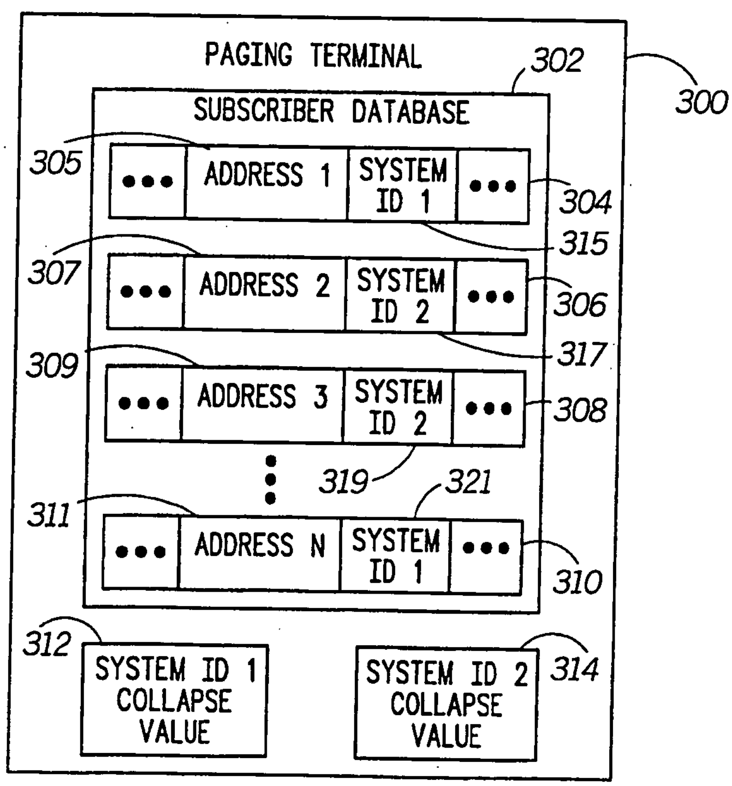

PAGING TERMINAL
302
300
SUBSCRIBER DATABASE
305
ADDRESS 1
SYSTEM ID 1
304
315
307
ADDRESS 2
SYSTEM ID 2
306
317
309
ADDRESS 3
SYSTEM ID 2
308
319
321
311
ADDRESS N
SYSTEM ID 1
310
312
SYSTEM ID 1 COLLAPSE VALUE
SYSTEM ID 2 COLLAPSE VALUE
314

FIG. 3

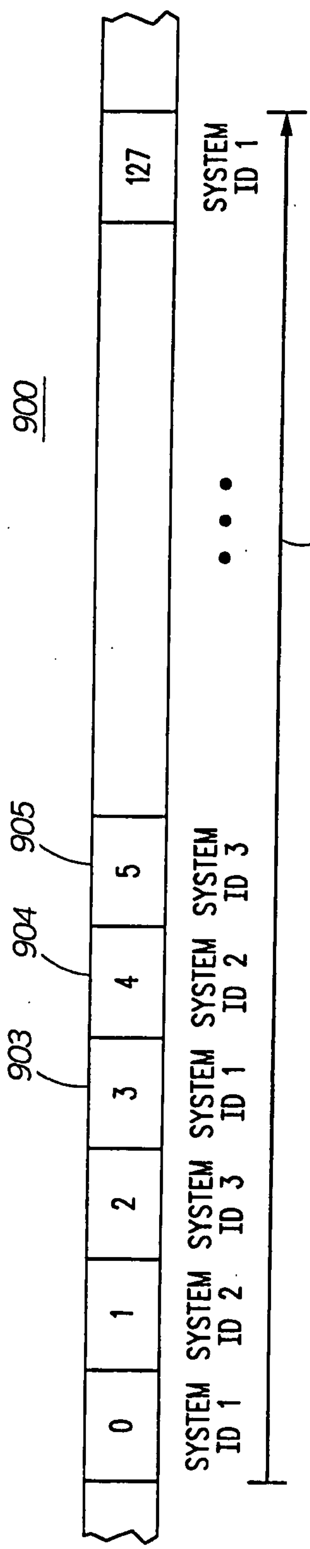


FIG. 9

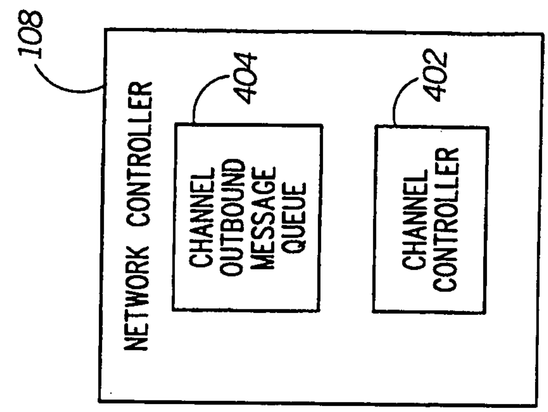


FIG. 4

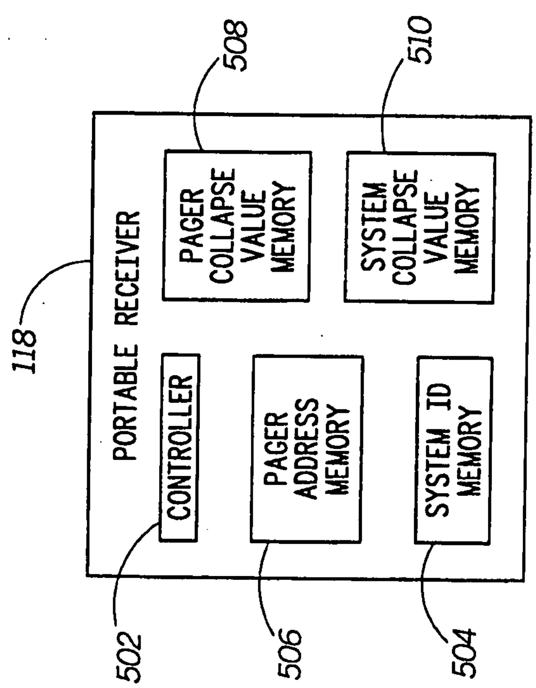
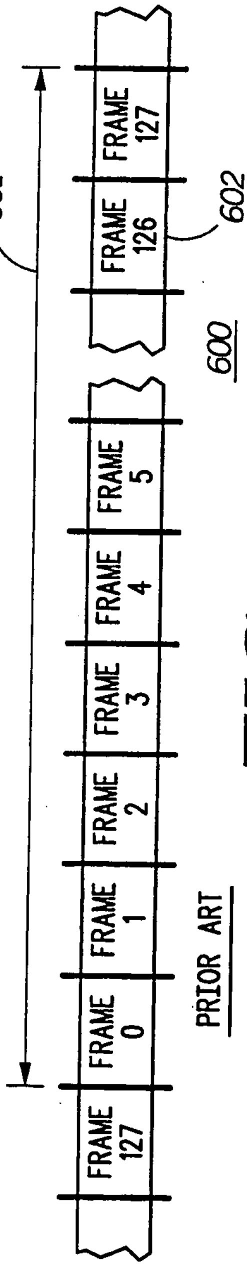


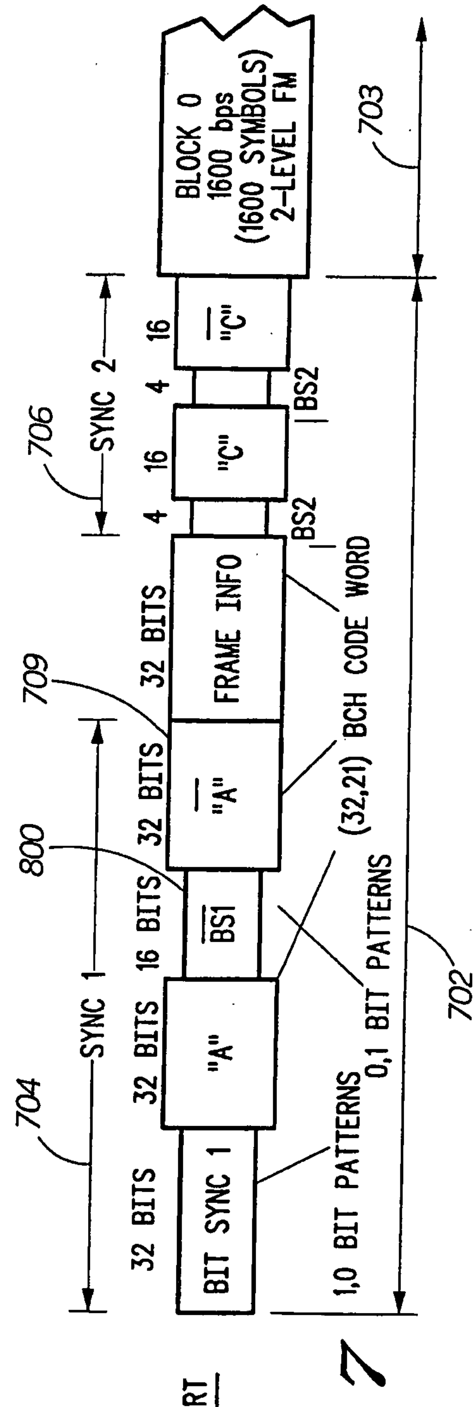
FIG. 5



PRIOR ART

600

FIG. 6



PRIOR ART

700

FIG. 7

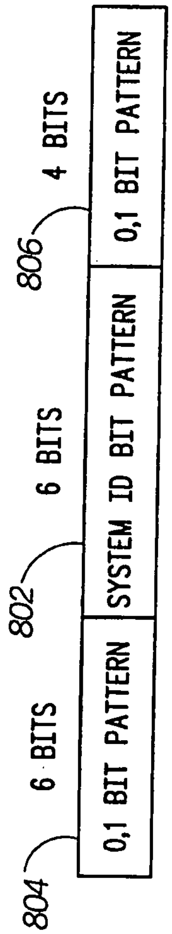


FIG. 8

800

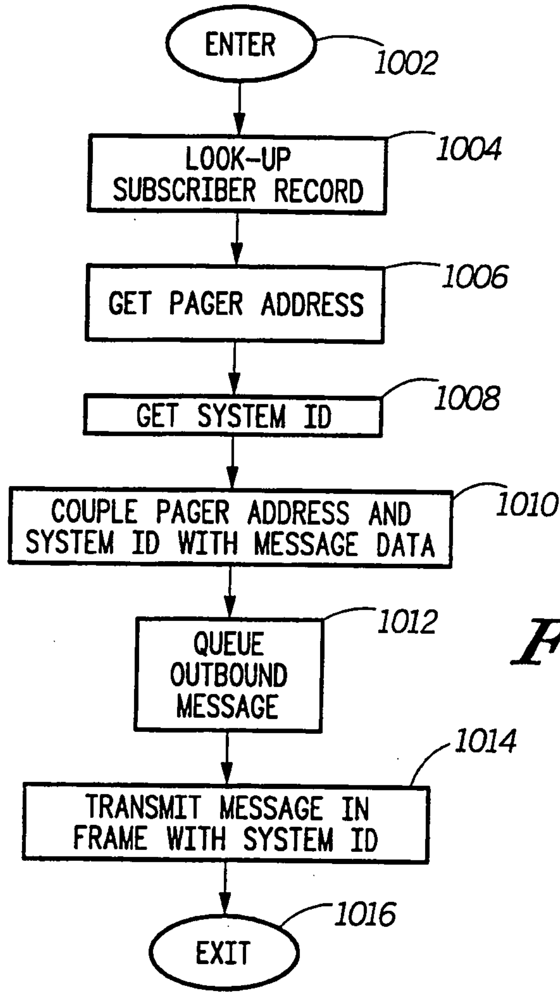

ENTER
1002
LOOK-UP SUBSCRIBER RECORD
1004
GET PAGER ADDRESS
1006
GET SYSTEM ID
1008
COUPLE PAGER ADDRESS AND SYSTEM ID WITH MESSAGE DATA
1010
QUEUE OUTBOUND MESSAGE
1012
TRANSMIT MESSAGE IN FRAME WITH SYSTEM ID
1014
EXIT
1016

FIG. 10

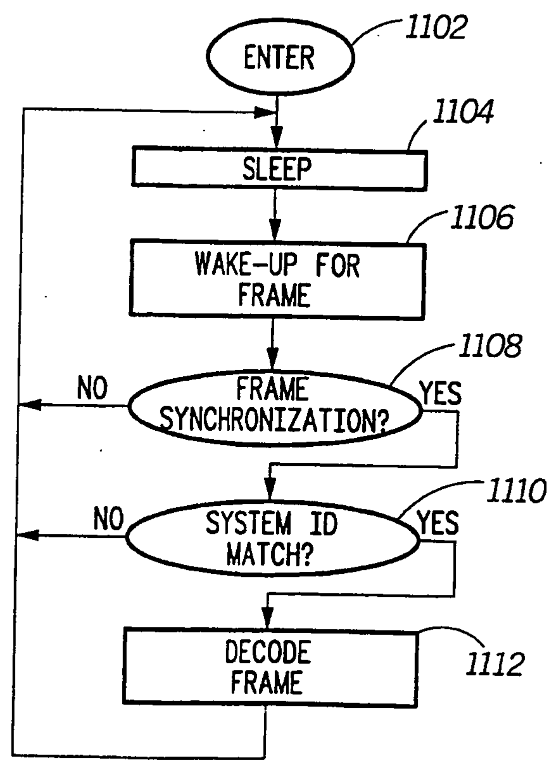

ENTER
1102
SLEEP
1104
WAKE-UP FOR FRAME
1106
FRAME SYNCHRONIZATION?
1108
NO
YES
SYSTEM ID MATCH?
1110
NO
YES
DECODE FRAME
1112

FIG. 11

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 99/20784

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04Q7/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	US 5 745 481 A (SUMNER TERENCE EDWARD ET AL) 28 April 1998 (1998-04-28) column 4, line 56 - line 63 column 5, line 31 - line 39 column 7, line 47 - line 58 column 9, line 6 -column 10, line 5 column 13, line 42 -column 14, line 16 ---	1-3,7-9 10 4
Y	EP 0 797 365 A (DEUTSCHE TELEKOM MOBIL) 24 September 1997 (1997-09-24) page 2, column 2, line 9 - line 54 ---	10
X A	US 5 315 642 A (FERNANDEZ JORGE D) 24 May 1994 (1994-05-24) column 5, line 40 -column 6, line 13 -----	7,8 5

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
7 January 2000	14/01/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Bernedo Azpiri, P

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/US 99/20784

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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EP 0797365 A	24-09-1997	DE 19610506 A	25-09-1997
		AU 2632597 A	10-10-1997
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